

# 2012 FRONTIERS IN EDUCATION CONFERENCE

October 3-6, 2012 • • • Seattle, Washington

## **PROCEEDINGS** *Soaring to New Heights in Engineering Education*



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# WELCOME FROM THE GENERAL CO-CHAIRS

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On behalf of the three sponsoring societies and Seattle University, we are pleased to welcome you to FIE 2012. The lifetime of FIE, 42 years and counting, has been a time of many innovations in engineering and computing education. The Frontiers in Education Conference has become the premiere conference for presentation and discussion of excellent educational research and innovative curricula in engineering education. This accomplishment would not have been possible without the vision and strong leadership of the three sponsoring professional societies – ASEE Educational Research and Methods Division, IEEE Computer Society, and the IEEE Education Society. We, along with the sponsoring societies, are proud of the rich traditions of the FIE and the many

engineering educators and educational researchers from around the globe who have contributed so much to our present understanding of how students learn. We are excited to bring this year's conference to the West Coast, where it is more easily accessible to our colleagues around the Pacific Rim. The theme of this year's conference, "Soaring to New Heights in Engineering Education" focuses on expanding the diverse community of international scholars and enriching the foundation of educational research that FIE has built over its history. It seems only fitting then that we continue this celebration of "soaring to new heights" by hosting this year's reception at the Museum of Flight.

Also fitting with this year's theme and location, we have expanded our outreach efforts to include Asia and Australia and are quite eager to learn of your educational efforts. Welcome to all first timers at FIE, whether international or local. We hope you become ambassadors for FIE by supporting our goals of enriching engineering education and informing other colleagues of your experiences.

FIE 2012 has an exciting and innovative technical program which is made possible by the Planning Committee, a large group of dedicated professionals who volunteer their time to this cause. The program co-chairs from the sponsoring societies – Reid Bailey and Archie Holmes of ERM, Steve Frezza of the IEEE Computer Society, and Lance Perez of the IEEE Education Society – coordinate the paper review process and organize the technical sessions. The program co-chairs are joined by the International Program Chairs, Ming Zhang, Mark Lee, Edmundo Tovar Caro and Melany Ciampi and the Special Sessions Chair Kevin Gary. Ingrid Russell, as the New Faculty Fellows Chair, coordinates the new faculty fellows program, a valuable influx of new people and innovations. Robert Hofinger continues in his key role as Exhibits Chair and Ed Jones as Conference Historian. We are pleased to have had such a dedicated group of program chairs who provide countless hours to organize the technical sessions, workshops, and special sessions that make FIE the innovative and compelling conference that it is.

In addition to selecting the technical program, there is a great deal of logistics and support planning that must be accomplished to make FIE the special conference that it is. We are both fortunate and thankful for the logistics support from Kevin Curry, Assistant to the General Chairs, and the University of Kansas Continuing Education staff and to Chris Dyer, Publications Chair. In addition to providing all of the logistical support that is necessary for the conference, Kevin continues to provide the continuity and institutional memory that is necessary for the planning committee to do its job. In addition, we would like to thank Jennifer Karlin and Stuart Kellogg and the FIE 2011 Planning Committee who continue to offer the support and guidance for the FIE 2012 program. Finally, we would like to thank the FIE Steering Committee for their leadership in ensuring the uniqueness that is FIE.

FIE is more than just a place to present papers. It is a place to meet and welcome new people and reconnect with old colleagues. It is a place to interact and discuss new ideas and new innovations. In short, it is a place to build not only a community of scholars but a community of friends. While you are here, we hope that you will have an opportunity to enjoy some of the many attractions that Seattle has to offer.

Our conference hotel is located in the heart of downtown Seattle, within walking distance of many fine restaurants, the Seattle Art Museum, multiple live music venues, the Seattle waterfront with its stunning views across Puget Sound, and the unique Pike Place Market. If you are able to spend an extra day in Seattle, you can explore the natural beauty of the city and its surroundings, take a trip to Mt. Rainier National Park, or visit the Boeing factory to see the latest commercial airliners being constructed. Seattle offers something for every taste, including all of the great coffee you can drink!

**Your Co-Chairs,**  
***Richard Leblanc and Ann Sobel***

# MESSAGE FROM THE FIE STEERING COMMITTEE

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Welcome to Seattle and the 42nd annual Frontiers in Education Conference. This year the conference continues its long tradition of offering an outstanding technical program. Each year I learn so many new things at FIE. I have always particularly liked the sessions on first-year classes, curriculum assessment, and cooperative learning because these are areas I spend significant time thinking about each day on the job. But, last year one of the sessions that had the greatest impact on me was a workshop on the Philosophy of Engineering Education because it asked tough questions to participants about the nature of engineering, engineering knowledge, and engineering education. The effect of this workshop on my thought processes has been profound. I am confident that this year you will find many conference events that can similarly transform the way you think about engineering and education. **Immerse** yourself in hands-on learning at a workshop on

Wednesday. **Start** Thursday and Friday at the Plenary sessions where you can interact with leaders from both industry and academia as they challenge you to think differently about modern product development and the education of engineering and computer science students. **Attend** and ask questions at scores of high quality paper presentations in the many parallel tracks. **Engage** with others at the unique Catalyzing Collaborative Conversations Sessions on Thursday evening where anyone can catalyze educational change by bring forth new topics for group discussion. Finally, **enjoy** the many opportunities to network with colleagues from around the world at the breakfasts, lunches, exhibit hall breaks, and the fantastic reception at the Museum of Flight on Friday evening.

Dr. Edwin C. Jones is the Frontiers in Education conference historian. He notes that FIE began in Atlanta in the year 1971 as an IEEE Education Society sponsored event. Thirty-four papers were presented in six sessions and enjoyed by approximately 100 registrants. In just a few years, the ASEE Educational Research and Methods (ERM) division joined as a sponsor, the conference community grew, and the conference matured into a premier event in engineering educational theory and practice. In 1995, the IEEE Computer Society became the third sponsor and helped to expand the community even more by reaching out to computer science and software engineering professionals. Over the past four decades, the conference has grown from these historic roots to a four day event with more than 400 papers and 600 registrants.

Each of the three sponsoring societies elects three members to serve on the FIE Steering Committee. The Steering Committee is responsible for strategic mission and vision, long-term conference planning, conference management, and conference site selection. The committee meets in person twice each year and holds considerable discussion electronically throughout the year. Important questions that we have recently answered include:

- **Should FIE periodically move to a venue outside of North America (IEEE Regions 1 - 7)?** The Steering Committee recognized that FIE has a reputation as a premier North American conference. Thus, the committee wrote a long-term policy statement that encourages venues in other IEEE Regions but requires at least five years in North America after any such event. Be sure to reserve October on your calendar and join us in Madrid, Spain in 2014!
- **How can FIE continue to improve its technical program quality and impact factor?** The Steering Committee recognized that FIE has a highly respected proceedings record but also believed that a clear categorization of papers could help peer reviewers better judge the merit of each contributed work. Thus, the conference adopted three paper categories called innovative practice, research-to-practice, and research. The committee continues to work with Technical Program Chairs to improve the quality metrics used by peer reviewers in each category.
- **How can FIE assist its volunteers in learning about and contributing to the conference event?** The Steering Committee is working on a number of informational documents that describe the various volunteer conference roles, the city bid process, and the expectations of Technical Program Chairs. These documents will become visible on the main FIE conference website when they are finished ([www.fieconference.org](http://www.fieconference.org)).
- **How can FIE provide the highest quality product while maintaining registration price?** The Steering Committee worked for a number of years to move to transparent bidding processes for publications and for conference logistics. Formal request-for-proposal documents were written describing the responsibilities of these two important aspects of conference management. Bids were received from a number of vendors and through this fiscal process we have been able to leave the FIE registration price fixed for a number of years.

These are just some examples of work going on behind the scenes to make your conference experience better. The Steering Committee works for the Societies and the member communities. We encourage you to contact any one of us to discuss the FIE conference. We can be identified by Steering Committee ribbons on our conference badges.

# FIE 2012 PLANNING COMMITTEE

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Archie Holmes, University of Virginia  
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Arnold Pears, Uppsala University  
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Edmundo Tovar Caro, Universidad Politecnica de  
Madrid (June 2008 - June 2014)  
James Sluss, University of Oklahoma  
(June 2012 - June 2015)

# FUTURE FIE CONFERENCES

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**FIE 2013 Oklahoma City, Oklahoma, October 23 – 26**  
FIE 2014 Madrid, Spain

Are you interested in hosting a future FIE conference?  
Leave your business card at the registration desk, and  
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